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U.S. Department of the Interior • U.S. Geological Survey

# MINERAL INDUSTRY SURVEYS

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## PRECIOUS METALS IN OCTOBER 1997

U.S. mines produced 29,000 kilograms of gold and 134,000 kilograms of silver in October 1997. Production of silver was down by about 4% in Nevada and 8% in Arizona. Total silver production was down by about 5%.

### Gold

**International.**—Recently, Gold Fields of South Africa Ltd. (GFSA) and Gencor Ltd. (Gencor) announced a \$3.6 billion gold asset merger plan which would form the largest gold mining company in the world called Gold Shelf One Ltd. (Goldco). This merger would use economies of scale to become much more efficient and effective in exploiting contiguous ore reserves. However, Anglo American Corp. of South Africa Ltd. (AAC), currently the world's biggest gold producer, lobbied to scuttle or at least delay and make the merger more costly. ACC's holding in Gencor and GFSA mines were key in defeating a proposal to expand GFSA's Driefontein mine capital base which would allow it to become a vehicle for the merger. A similar battle took place over Gencor's Beatrix mine (American Metal Market, 1997).

Pegasus Gold Inc. announced that it is suspending mining operations at its Mt. Todd mine in Australia's Northern Territory. Likewise in Australia, Resolute Ltd. announced the closure of its Bullabulling mine. The further decline in the gold price appears to have been the final straw for these mining projects, and has led the Australian Government to announce the establishment of a discussion group in conjunction with representatives of the local mining industry to seek ways of improving its competitiveness (Mining Journal, 1997b).

Deutsche Bundesbank, the central bank of the Federal Republic of Germany, has placed about 10% of its gold reserves on the London bullion market in the form of loans to other banks. These 2.5 % interest loans will move 3,700 metric tons of gold to London banks. The actual sale of gold reserves is not a subject for discussion at Deutsche Bundesbank at this time

(Platt's Metals Week, 1997).

Asia Minerals Corp. plans to expand its gold output capacity at its Yingezhaung gold mine in China's Shandong province from 14,500 troy ounces of gold per year to about 91,000 ounces by July 1999. The 50:50 joint venture will be with China's Zhaoyuan Gold Industrial Group that owns 16 other Chinese mines. The mine is reported by Asia Minerals to be a low-cost gold producer at a cash cost of \$142 per ounce of gold (Metal Bulletin, 1997b).

**Update.**—There was a sharp rise in gold business during October on the London bullion market. The average daily turnover rose sharply to 42 million ounces of gold, the highest level since records began back in October 1996. This figure represents a 22% increase over September levels and 53% above the daily turnover for October 1996 (Metal Bulletin, 1997a).

Gold prices sank below \$300 on November 26 for the first time in over 12 years. The low gold price is encouraging a strong demand for gold, particularly in India for jewelry. However, in the rest of Asia, financial crises have not led to any significant increase in the demand for gold as currency depreciations are making gold, which is priced in U.S. dollars, more expensive (Mining Journal, 1997c). On December 5, gold prices reached \$287.40 (London PM Fixed price) before prices rebounded. The last time gold prices reached this level was on March 6, 1985.

### Silver

Anvil Mining reported that it has discovered abundant copper carbonate mineralization in samples from the first trench testing of old trenches and pits at the Dukulushi project in the Democratic Republic of Congo, formerly Zaire. The findings reportedly confirmed previous indications of high-grade near-surface copper mineralization. To confirm and delineate an open-pit resource, Anvil started a 3,000 meter drilling and

reverse circulation program. The first two drill holes, to depths of 65 and 110 meters have been completed. Previous work on the project outlined a near-surface copper-silver deposit having resources of 1.6 million tons at an average grade of 11% copper and 310 grams-per-ton silver. The deposit lies within an 11,950-square-kilometer concession which has other copper-silver deposits. Anvil holds a 90% interest in the concession. First Quantum Minerals, that recently acquired a 10% interest in Anvil Mining, has been granted licenses for the development of two tailings projects in the Democratic Republic of Congo (Mining Journal, 1997a).

**Nearly 2,000 Silver-Coated Mirrors Help Supply Electricity to California Homes.**—Solar Two, the latest advance in the use of mirror technology for the conversion of solar energy to useful electric power, is now producing power. Dependent upon silver-coated mirrors for the highest possible reflection of sunlight into a heat-absorbing medium, the new system is now supplying sufficient electricity to power 10,000 California homes. Unlike Solar One, Solar Two uses molten salt instead of boiling water as the heat-collecting medium. Molten salt has the advantage of retaining its heat long after the sun goes down. With an intensity many times that of the sun being reflected from 1,926 silver-coated mirrors—hanging on black-coated stainless steel tubes atop a 300-foot tower—the solar heat reflected from the mirrors heats the nitrate salt to over 1050°F (566°C). Located in the Mojave Desert where sunny days are the norm, 82,595 square meters of silver-coated mirrors reflect solar energy to the tower. Solar Two has become the proving ground for molten-salt technology. It serves as a final step toward constructing full-scale commercial plants capable of generating 100 to 200 million watts of electricity and providing a cost-effective alternative to coal- and oil-generated electricity (Silver News, 1997).

### Platinum-Group Metals

**Stillwater Undecided About Second Mine.**—Stillwater Mining will resume construction of a tunnel-boring machine at the East Boulder project, near the company's platinum and palladium mine in Nye, Montana. Stillwater shelved plans for the project earlier in the year, leaving the machine unfinished. Stillwater plans to have the 15-ft. machine operable by spring 1998. It is now two-thirds finished. The tunnel borer will be used to drive an adit 18,500 feet towards the J-M reef at a cost of about \$20 million. During the 18 months required to drive the adit, the company will complete a final feasibility study, check the grade continuity of the reef, and determine a cost estimate for the construction of the overall project. Stillwater will then decide whether or not to proceed with development of what would be the second mine on the J-M reef. The project is

13 miles west of the Stillwater Mine and reportedly has the potential to match production there. Stillwater is also considering a second expansion at the Stillwater Mine, which would increase production there by 300,000 ounces per year, starting in 1999 (Northern Miner, 1997).

**Ruthenium Intermetallic Compound Undergoing Test For Possible Use In Sparkplug.**—A new generation of sparkplug material, which fulfilled the stringent requirements of the modern automotive industry, is undergoing test work in laboratories. The novel electrodes make use of an intermetallic compound, ruthenium aluminide, with an unusual blend of properties. Unlike conventional alloys, which are mixtures of phases without any particular chemical formula, intermetallic compounds are single phases based on definite atomic formulae, with a fixed or narrow range of chemical composition. The chemical bonding may be purely metallic, or partly ionic or covalent. These phenomena are responsible for the intermetallic compound's high melting point and great strength, particularly at high temperatures. These properties make intermetallics potential candidates for use as high-temperature structural materials. However, the main potential application for ruthenium aluminide is in sparkplug electrodes. An extensive test program for RuAl-based sparkplug electrodes reportedly has found that the material possesses all the physical and mechanical requisites: (1) it is tough enough to withstand the thermal shock associated with cycling between temperatures of 60°C and 3,000°C, (2) it resists arc erosion and oxidation, and (3) it has the necessary thermal conductivity to conduct heat rapidly from the working face, preventing pre-ignition even in high-performance engines (Mintek Bulletin, 1997).

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TABLE 1  
MINE PRODUCTION OF RECOVERABLE GOLD AND SILVER IN THE UNITED STATES, BY STATE 1/

(Kilograms)

	Arizona	California	Montana	Nevada	Other States 2/	Total
<b>Gold:</b>						
1996:						
October	223	1,920	1,140	19,100	5,330	27,800
November	125	1,860	929	18,000	4,810	25,700
December	124	1,980	876	19,800	5,210	28,000
Jan.-Dec.	1,740	23,800	9,110	213,000	69,900	318,000
1997: p/						
January	W	1,800	948	18,500	5,600	26,900
February	W	1,800	659	16,400	5,430	24,300
March	W	1,850	671	20,400	5,310	28,200
April	W	1,850	618	18,900	5,730	27,100
May	102	1,830	640	19,700	5,970	28,300
June	74	1,770	W	21,000 r/	6,020	28,900 r/
July	W	1,790	648	20,700 r/	5,620	28,800 r/
August	W	1,800	474	20,600 r/	5,440	28,300
September	W	1,790 r/	632	20,600 r/	5,310	28,300
October	W	1,730	W	21,700	6,030	29,500
Jan.-Oct.	176	18,000	5,290	199,000	56,500	278,000
	Arizona	California	Idaho	Nevada	Other States 3/	Total
<b>Silver:</b>						
1996:						
October	12,500	1,450	18,600	67,700	35,800	136,000
November	13,900	1,340	17,700	48,900	32,200	114,000
December	14,100	1,250	17,800	58,300	34,800	126,000
Jan.-Dec.	188,000	21,600	229,000	605,000	530,000	1,570,000
1997: p/						
January	11,200	1,560	W	63,000	61,700	138,000
February	10,300	1,530	W	44,700	62,100	119,000
March	14,700	1,810	W	60,200	56,800	133,000
April	12,600	2,110	W	56,500	62,900	134,000
May	13,500	1,880	W	45,400	67,700	128,000
June	14,600	1,720	W	58,800	61,800	137,000
July	13,200	W	W	57,000 r/	60,800	131,000 r/
August	14,900	W	W	64,600 r/	62,700	142,000 r/
September	12,600	W	W	80,700 r/	65,400	159,000 r/
October	11,600	W	W	77,200	62,000	151,000
Jan.-Oct.	129,000	10,600	W	608,000	624,000	1,370,000

p/ Preliminary. r/ Revised. W Withheld to avoid disclosing company proprietary data; included with "Other States."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes Alaska, Colorado, Idaho, New Mexico, South Carolina, South Dakota, Utah, Wisconsin, and States indicated by symbol "W."

3/ Includes Alaska, Colorado, Michigan, Missouri, Montana, New Mexico, New York, South Carolina, South Dakota, Utah, Wisconsin, and States indicated by symbol "W."

TABLE 2  
SELECTED PRECIOUS METAL PRICES

(Dollars per troy ounce)

	Gold	Silver	Platinum	Palladium
<u>Engelhard Industries:</u>				
<u>1996:</u>				
Low/date	368.67 (Dec. 03)	4.67 (Dec. 03)	368.00 (Dec. 16)	117.00
High/date	391.06 (Aug. 05)	5.82 (Feb. 02)	433.00 (Feb. 05)	146.00
Average	389.08	5.20	397.97	130.39
<u>1997:</u>				
<u>September:</u>				
Low/date	321.65/17	4.58/17	419.00/03	197.00
High/date	333.31/30	5.23/30	435.00/30	206.00
Average	323.91	4.74	425.95	200.38
<u>October:</u>				
Low/date	312.58/31	4.69/28	400.00/28	202.00
High/date	338.37/01	5.28/08	438.00/15	232.00
Average	326.07	5.02	424.73	214.21
<u>November:</u>				
Low/date	298.15/26	4.83/07	384.00/25	214.00
High/date	316.54/04	5.39/21	411.00/04	220.00
Average	308.27	5.06	396.38	217.05
<u>Year to date:</u>				
Low/date	298.15 (Nov. 26)	4.22 (July 08)	384.00 (Nov. 25)	177.00
High/date	367.82 (Jan. 01)	5.39 (Nov. 21)	490.00 (June 06 & 09)	246.00
Average	337.32	4.82	399.08	182.42
<u>Handy and Harman:</u>				
<u>1996:</u>				
Average	387.81	5.18	XX	XX
<u>1997:</u>				
September	322.74	4.72	XX	XX
October	324.87	5.00	XX	XX
November	307.10	5.06	XX	XX
Year to date	335.02	4.81	XX	XX
<u>London Final:</u>				
<u>1996:</u>				
Average	387.70	5.20	XX	XX
<u>1997:</u>				
September	322.82	4.73	XX	XX
October	324.87	5.04	XX	XX
November	306.03	5.07	XX	XX
Year to date	335.00	4.82	XX	XX

XX Not applicable.

Source: Platt's Metals Week.

TABLE 3  
U.S. IMPORTS AND EXPORTS OF GOLD, BY COUNTRY 1/

(Kilograms of gold content, unless otherwise specified)

Country	Ores and concentrates 2/	Dore and precipitates	Refined bullion 3/	Total	Waste and scrap 4/ (gross weight)
Imports for consumption:					
1996:	3,460	11,900	143,000	159,000	13,000
1997:					
July	72	908	17,100	18,100	1,060
August	84	760	13,000	13,800	1,030
September:					
Brazil	--	--	2,400	2,400	--
Canada	--	288	12,900	13,200	23
Chile	18	12	400	430	1
Colombia	--	--	257	257	243
Dominican Republic	--	--	38	38	393
Mexico	96	878	135	1,110	142
Peru	--	--	703	703	17
Switzerland	--	--	457	457	--
Other	--	223	483	706	358
Total	114	1,400	17,800	19,300	1,180
Year to date	1,490	10,700	149,000	161,000	9,300
Exports:					
1996:	374	65,100	406,000	471,000	89,900
1997:					
July	83	4,750	17,600	22,500	4,010
August	6	10,100	14,500	24,600	5,670
September:					
Canada	56	908	113	1,080	2,840
Germany	--	--	--	--	1,780
Korea, Republic of	--	--	1,220	1,220	--
Mexico	--	--	1,190	1,190	--
Switzerland	--	2,500	6,880	9,380	94
United Kingdom	--	5,310	6,110	11,400	815
Other	--	2	787	787	147
Total	56	8,730	16,300	25,100	5,670
Year to date	334	55,900	340,000	396,000	44,700

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes gold content of base metal ores, concentrates, and matte imported for refining.

3/ Bullion also moves in both directions between U.S. markets and foreign stocks on deposit in the Federal Reserve Bank. Monetary gold excluded.

4/ "Waste and scrap" not included in "Total."

Source: Bureau of the Census.

TABLE 4  
U.S. IMPORTS AND EXPORTS OF SILVER, BY COUNTRY 1/

(Kilograms of silver content, unless otherwise specified)

Country	Ores and concentrates 2/	Dore and precipitates	Refined bullion	Total	Waste and scrap 3/ (gross weight)
<b>Imports for consumption:</b>					
1996:	153,000	281,000	2,580,000	3,010,000	1,810,000
1997:					
July	12,300	24,200 4/	159,000	196,000	68,000
August	15,100	6,430	200,000	222,000	88,200
September:					
Canada	--	16	69,100	69,100	26,100
Chile	498	21,200	500	22,200	97
Germany	--	--	--	--	33,400
Malaysia	--	--	--	--	9,430
Mexico	15,200	268	79,400	94,900	60
Peru	--	--	20,500	20,500	--
Portugal	--	--	--	--	20,000
United Kingdom	--	--	183	183	--
Other	--	159	429	589	558
Total	15,700	21,600	170,000	208,000	89,600
Year to date	113,000	231,000	1,540,000	1,890,000	1,040,000
<b>Exports:</b>					
1996:	1,520 r/	43,300	2,900,000 5/	2,950,000	1,280,000
1997:					
July	13,200	3,070	223,000	239,000	79,400
August	--	2,560	202,000	204,000	73,100
September:					
Belgium	--	--	--	--	10,100
Canada	173	--	3,590	3,760	32,600
China	--	787	--	787	3,650
France	--	--	--	--	1,450
Germany	--	--	--	--	1,990
Japan	--	--	--	--	35,700
Netherlands	--	--	18,400	18,400	--
Sweden	--	--	--	--	5,050
Taiwan	--	2,750	--	2,750	--
United Arab Emirates	--	--	90,600	90,600	--
United Kingdom	--	--	187,000	187,000	10,400
Other	--	122	--	122	1,770
Total	173	3,650	299,000	303,000	103,000
Year to date	29,200	54,000	2,100,000	2,180,000	737,000

r/ Revised.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes silver content of base metal ores, concentrates, and matte imported for refining.

3/ "Waste and scrap" not included in "Total."

4/ All or part of these data have been referred to the Bureau of the Census for verification.

5/ Verification of Bureau of the Census exports was not possible for some months of 1996.

Source: Bureau of the Census.

TABLE 5  
U.S. IMPORTS AND EXPORTS OF PLATINUM-GROUP METALS, BY COUNTRY 1/

(Kilograms of metal content, unless otherwise specified)

Country	Ores and concentrates	Waste and scrap (gross weight)	Refined					Osmium	Ruthenium
			Platinum	Palladium	Rhodium	Iridium			
Imports for consumption:									
1996:	1,960	5,060	73,700 2/	146,000	9,650	1,810	329	15,600	
1997:									
July	--	408	6,070	10,600	828	217	18	519	
August	--	560	4,890	11,900	777	147	--	1,080	
September:									
Australia	--	--	515	--	--	--	--	--	
Belgium	--	--	289	994	41	--	--	--	
Canada	--	65	173	390	--	--	--	--	
Germany	--	--	390	843	23	1	--	33	
Japan	--	12	--	1,120	--	--	--	--	
Norway	--	5	52	152	6	--	--	--	
Russia	--	--	34	8,630	5,210	--	--	425	
South Africa	--	--	4,190	1,650	341	95	--	1,160	
Switzerland	--	--	237	850	105	--	--	47	
United Kingdom	--	114	535	454	1	37	--	125	
Other	--	149	646	80	--	--	--	--	
Total	--	345	6,540	15,200	5,720	133	--	1,790	
Year to date	--	3,930	55,300	85,500	10,900	1,180	36	9,460	
Exports:									
1996:	484	8,640	12,700	26,700	196	123 3/			
1997:									
July	50	1,730	2,900	5,320	54	32 3/			
August	44	1,410	2,430	4,140	4	8 3/			
September:									
Australia	--	--	827	1	--	--			
Belgium	--	13	468	415	--	--			
Canada	--	39	38	110	--	--			
France	--	--	22	1	--	--			
Germany	--	91	51	174	--	1 3/			
Italy	--	3	1	313	--	1 3/			
Japan	--	79	27	13	--	3 3/			
Korea, Republic of	--	--	58	210	3	--			
Mexico	--	--	8	607	--	--			
Netherlands	--	--	9	260	--	1 3/			
Switzerland	--	--	10	167	--	--			
Taiwan	--	--	6	366	--	3 3/			
United Kingdom	20	404	94	113	--	59 3/			
Other	--	--	105	63	5	--			
Total	20	630	1,720	2,810	8	67 3/			
Year to date	545	10,100	18,600	33,500	146	517 3/			

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Of this amount, 2,070 kilograms was in the form of platinum coins.

3/ Includes osmium and ruthenium.

Source: Bureau of the Census.